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(54) **APPARATUS FOR TREATING A MOVING SURFACE**

VORRICHTUNG ZUR BEHANDLUNG EINER BEWEGTEN OBERFLÄCHE

APPAREIL DESTINE AU TRAITEMENT D'UNE SURFACE EN DEPLACEMENT

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Description

APPARATUS OF THE INVENTION

[0001] The present invention relates to surface treatment apparatus for coating or cleaning a moving surface, such as a rotating roller, a moving belt or a similar surface, said apparatus comprising

- at least one surface treatment brush having bristles made of an elastic material, and means for pressing the points of the bristles of the surface treatment brush against the moving surface,
- and means for moving the surface treatment brush transversely relative to the direction of motion of the surface, e.g. in the direction of the axis of the rotating roller or the axis of a roller supporting the moving belt.

PRIOR-ART APPARATUS

[0002] It is known that rotating rollers in the calenders of paper machines, in glazing calenders, printing presses or equivalent tend to gather all sorts of impurities, such as e.g. paper dust, paper coating material or other material, from the paper web touching the roller surface, and these impurities may burn to the roller surface and adhere fast on it. In a printing press, e.g. printing ink may remain sticking to the roller. Because of such impurities, the rollers have to be cleaned regularly. If the roller surface is not cleaned, then the quality of the paper or other product being treated falls rapidly.

[0003] In prior-art paper machines, rotating rollers are cleaned by shaving the roller surfaces with special shaving plates called doctor blades. By scraping the roller surface, the doctor blades shave the impurities off the roller surface, the scrapings being thus accumulated on the blade. In the calenders of paper and coating machines, the doctors usually consist of metallic or composite plastic blades shaving the roller surface. Doctor blades can be kept continuously in operation.

[0004] However, the use of doctor blades has the drawback that the doctor blade is subject to fast wear. This is because the blade is continuously rubbing against the surface of a metallic roller cylinder, which is usually made of steel. Often the wear of the doctor blade is non-uniform, with the result that the blade does not follow the roller surface accurately. As a consequence, the unevenly worn doctor blade may also damage the roller surface.

[0005] Another disadvantage with the use of doctor blades is that they do not always work reliably. In the drying section of a paper machine, glutinous matter tends to burn to the surface of the foremost cylinders, and this matter pushes in between the cylinder and the doctor blade, forcing the doctor blade to rise clear of the cylinder surface. As a result, the cylinder surface tends to become striped with streaks of impurities that cannot be removed by a doctor blade. It is also possible for chaff to get between the roller and the doctor blade, producing detrimental grooves on the roller surface to be cleaned. In this case, too, the doctor blade can no longer clean the roller, which therefore has to be removed from the paper machine for reconditioning.

[0006] Another disadvantage with the doctor knife is that the doctor blade as such cannot remove the impurities shaved off the roller. Dust and other dirt shaved off the roller is accumulated on the blade, from where it has to be removed by some means or other. In prior art, various suction ducts and other solutions are used. However, the impurities may still get between the doctor blade and the roller surface, where they may produce grooves in the roller surface.

[0007] In addition to doctor blades, various rotating cleaning means, such as e.g. rotary brushes, have been used for cleaning the surface of a rotating roller. Used together with moisturizing or dissolving agents, rotary brushes release from the rotating roller surface impurities that are sticky or otherwise difficult to remove. Since sticky materials adhere to the brush and would soon block it, a brush cleaning action performed regularly or continuously is implemented using e.g. jets of water or diluent. It is clear that if a large amount of sticky impurities is accumulated on the surface of a rotating roller, then an efficient cleaning device of some kind as described above will be necessary.

[0008] However, in a paper machine, in most cases the material accumulating on the roller surface mainly consists of impurity particles such as paper dust and pieces of paper of different sizes. They are held sticking to the surface of the rotating roller by the action of moisture and possible coating material added to the paper. If these impurities are not immediately removed from roller surface, they will cause definite harm. Some of the particles will be carried along with the paper web, impairing the paper quality, and some of these originally loose particles will soon burn fast to the surface of the rotating roller because many rollers in the paper machine are very hot.

[0009] In present-day paper machines, however, no suitable methods or equipment are known that could be used for removing impurities like those described above from the surface of a rotating roller during production while the paper machine is running- The doctor blade generally used for cleaning the roller surface is too hard a means for this purpose, and the blade is subject to fast wear and also causes too much wear of the roller surface. Neither is the use of rotary brushes applicable for this purpose because a rotating brush does not bind any loose impurities in itself. A rotating brush would fling the particles released from the roller surface into the air, from where they would settle on the paper web as the machine is running, thus impairing the quality of the paper being produced. It is true that roller cleaning devices used to remove sticky impurities during an outage of the paper machine are usually provided with an encasement to allow washing of the brushes, but the encasement would not stop the dust from being flung from the rotating brush onto the paper web during production.

[0010] WO-A-98/22652 presents a method and apparatus for cleaning moving surface. The surface treatment elements are doctor blades, which move across the moving surface and will be cleaned by pressure cleaner outside the moving surface. The doctor blades are too hard for cleaning the surface thoroughly and may produce grooves in the roller surface.

[0011] US-A-5 015 303 presents a device with several brushes, which has an oscillating motion across the moving surface. Because the sticky impurities easily accumulate on the surface of a rotating roller, the brushes must be cleaned continuously using e.g. jets of water or diluent.

APPARATUS OF THE INVENTION

[0012] The object of the invention is to achieve a surface treatment apparatus for treating or cleaning a moving surface, such as a rotating roller, a moving belt or an equivalent surface.

FEATURES CHARACTERISTIC OF THE APPARATUS OF THE INVENTION

[0013] The apparatus of the invention is characterized in that

- the surface treatment brushes of the surface treatment apparatus are attached to an endless loop, such as a chain, by means of which the brushes can be moved transversely across the moving surface and further beyond the edge of the surface so that the bristles of the surface treatment brush are disengaged from the moving surface, and that
- in the return path of the brushes in the endless loop, the brushes move in the opposite direction across the moving surface and further over the opposite edge.

[0014] By using the apparatus of the invention, a moving surface can be treated in many different ways. The surface can be e.g. cleaned, ground, oxidized or coated, as will be described below.

[0015] Another possibility is to press against the moving surface a surface treatment element which, instead of a brush, consists of e.g. felt, net or other elastic material that is capable of treating the surface or releasing impurities from the moving surface and/or gathering loose impurities and dust into itself, which can then be removed from the moving surface to a position outside it by means of the surface treatment element.

[0016] When the apparatus of the invention for treating a surface is used to clean a moving surface, the bristles pressed against the surface loosen impurities from the surface. The loosened material, such as paper dust, then sticks between the bristles of the brush and is carried with the brush toward the edge of the moving surface. As the points of the bristles are held continuously pressed against the moving surface, at least some of the bristles are subjected to a longitudinal compression stress, causing bending of the bristles. As the bristles move further over the edge of the moving surface, they are released from the stress. At the same time, the bristles which had been bent under the stress straighten out suddenly, flinging the impurities carried with the bristles off the brush away from the moving surface, such as a rotating roller. Alternatively, the bristles may also be passed over some other threshold to rid them of the impurities. Another possibility is to use e.g. compressed air to clean the bristles. In this case, the impurity particles removed from the bristles are emitted into the ambient air in the vicinity of the end of the roller or the edge of the belt, but the impurity particles can also be carried away via a suitable duct if necessary.

[0017] According to the invention, by using a metallic brush, the surface can be both cleaned and abraded, so that the surface is smoothed at the same time by cutting off roughness peaks and by filling pits.

[0018] The abrasion between the metallic brush and the moving surface produces heat, causing changes in the structure of the oxide layer of the surface. As a result, the moving surface becomes smoother, more wear resistant and is more likely to remain clean. The material of the metallic brush is e.g. steel, stainless steel, brass or bronze.

[0019] The abrasion method of the invention using a metallic brush can at least partially replace the grinding of the rollers of a paper machine, which in a prior-art method is performed using abrasive paper belts. However, abrasive paper can only be used as long as its grinding edges remain in a good cutting condition. The wear and clogging of abrasive paper increase the friction between the abrasive paper and the roller being ground, further heating the surface being ground. As a result, the surface layer of the roller becomes harder and is liable to being cracked.

[0020] According to the method of the invention, a plastic brush is pressed against the moving surface and plastic material is transferred from the brush to the moving surface as a result of abrasion. Thus, the moving surface can be coated with a thin plastic layer, the material of which is e.g. teflon.

[0021] The surface treatment element pressed against the moving surface may also consist of e.g. felt, net or other material capable of releasing impurities from the moving surface and/or gathering loose impurities and dust, which can then be removed away from the moving surface by means of the surface treatment element.

[0022] The bristles of the surface treatment brush pressed against the moving surface are made of a metallic material, such as stainless steel or brass, plastic or from natural bristles obtained from animals or plants. The essential point is that the bristles are made of a material having at least some elasticity and are also capable of loosening and/or gathering impurities and dust as well as removing them.

[0023] The surface treatment brush of the invention can be effectively applied in many different uses. It is applicable for the cleaning, abrasion, oxidation and coating of a surface, as will be described below. A brush also involves fewer problems than e.g. a doctor blade. The elasticity of the brush permits larger installation tolerances. Besides, the wear of an elastic brush causes no problems because a contact with the moving surface is maintained regardless of wear. The brush is therefore applicable in continuous operation. The bristles of the brush can also get into grooves in the moving surface, such as e.g. a rotating roller.

EMBODIMENTS OF THE APPARATUS OF THE INVENTION

[0024] A preferred embodiment of the surface treatment apparatus of the invention is characterized in that the surface treatment brushes attached to an endless chain are in contact with the moving surface during their movement in one direction or during their movement in both directions.

[0025] A second preferred embodiment of the surface treatment apparatus of the invention is characterized in that the surface treatment brushes attached to an endless chain are in contact with one moving surface or simultaneously with two moving surfaces, such as two adjacent rollers.

[0026] A third preferred embodiment of the surface treatment apparatus of the invention is characterized in that the surface treatment brushes attached to an endless chain can be alternately brought into contact with two moving surfaces, such as two adjacent rollers.

[0027] A fourth preferred embodiment of the surface treatment apparatus of the invention is characterized in that the direction of motion of the surface treatment brushes attached to an endless chain can be reversed.

[0028] A fifth preferred embodiment of the surface treatment apparatus of the invention is characterized in that the surface treatment apparatus provided with an endless chain and surface treatment brushes is a separate unit which can be mounted as such in the vicinity of any moving surface or in conjunction with an existing device, such as a doctor blade on a roller.

[0029] A sixth preferred embodiment of the surface treatment apparatus of the invention is characterized in that the moving means of the surface treatment apparatus provided with an endless chain and surface treatment brushes comprises an actuator consisting of an electric device, a pneumatic cylinder or equivalent which moves the endless chain and the surface treatment brushes attached to it on the moving surface. The slide surfaces of the pneumatic cylinder may be made of a ceramic material, in which case the moving means will need no lubrication at all. A lubricant could stain e.g. paper being produced in a paper machine.

[0030] An seventh preferred embodiment of the surface treatment apparatus of the invention is characterized in that the bristles of the brush of the surface treatment apparatus provided with an endless chain and surface treatment brushes are made of a metallic material, such as steel, stainless steel, brass, a synthetic material, such as plastic, e.g. teflon, or from natural bristles, such as bristles obtained from animals or plants.

[0031] The brush has the advantage that it can effectively release impurities from the moving surface, clean the surface, smooth rough areas in the surface and bind in itself the material and loose chaff removed from the surface, which material and chaff can then be removed with the brush away from the surface. The brush can also be easily cleaned outside the moving surface, whereupon the brush is again brought into contact with the moving surface. By using a metallic brush, besides cleaning the surface it is also possible to produce an effect smoothing, hardening, and glazing the moving surface and keeping it clean. By using a plastic brush, made of e.g. teflon, besides a cleaning effect additionally a coating and lubricating effect is produced on the moving surface.

[0032] An eighth preferred embodiment of the surface treatment apparatus of the invention is characterized in that the surface treatment apparatus provided with an endless chain and surface treatment brushes comprises at least one metallic brush which can be moved transversely across the moving surface and has metallic bristles, the points of which can be pressed against the moving surface to clean, abrade or oxidize said surface.

[0033] An ninth preferred embodiment of the surface treatment apparatus of the invention is characterized in that the surface treatment apparatus provided with an endless chain and surface treatment brushes comprises at least one plastic brush which can be moved transversely across the moving surface and has plastic bristles, the points of which can be pressed against the moving surface to clean or coat said surface.

[0034] An essential feature of the surface treatment apparatus of the invention is that it can be used in process, e.g. while paper production is going on. Thus, the apparatus remains continuously mounted in conjunction with a roller e.g. in a paper machine instead of being only mounted e.g. during servicing shutdowns.

EXAMPLES OF EMBODIMENTS

[0035] In the following, the invention will be described by the aid of examples with reference to the attached drawings, wherein

LIST OF ILLUSTRATIONS

[0036]

Fig. 1 presents a diagrammatic top view of a rotating roller and an apparatus according to the invention for the treatment of the roller surface.

Fig. 2 presents a diagrammatic top view of the structure of the apparatus of Fig. 1.

Fig. 3 presents a lateral view of a surface treatment apparatus according to the invention, used together with a doctor on a rotating roller.

Fig. 4 corresponds to Fig. 3 and presents a surface treatment apparatus used together with a doctor, in a second position.

Fig.5 presents a partially sectioned lateral view of a surface treatment brush as used in the apparatus of the invention.

Fig. 6 presents a front view of the surface treatment brush shown in Fig. 5.

Fig. 7 presents a diagrammatic side view of surface treatment apparatus according to the invention, mounted in conjunction with moving belts.

Fig. 8 presents a diagrammatic view of a second surface treatment apparatus with surface treatment brushes mounted in conjunction with a moving belt.

Fig. 9 presents a diagrammatic view of a surface treatment apparatus according to the invention, mounted on a roller and seen from the end of the roller.

Fig. 10 presents a diagrammatic view of the roller in Fig. 10 and the surface treatment apparatus of the invention in top view.

Fig. 11 presents a diagrammatic view of the surface treatment apparatus of the invention, mounted between two rollers and seen from the ends of the rollers.

Fig. 12 presents a diagrammatic top view of the rollers and the surface treatment apparatus of the invention shown in Fig. 11.

Fig. 13 corresponds to Fig. 11 and presents a diagrammatic view of a surface treatment apparatus according to the invention which can be moved between the rollers, seen from the ends of the rollers.

Fig. 14 presents diagrammatic side view of part of the end of a roller and part of a surface treatment apparatus according to the invention.

DESCRIPTION OF ILLUSTRATIONS

[0037] Fig. 1 presents a rotating roller 11, which is e.g. a drying cylinder in a paper machine. Mounted in conjunction with the roller 11 is a surface treatment apparatus 10 comprising a number of brushes 12. The brushes 12 are pressed against the surface of the roller 11 and connected to an endless chain in a device for moving the brushes 12. The brushes 12 connected to the endless chain move in the direction of the axis of the roller 11, to the right in Fig. 1. Connected to one end of the apparatus 10 is a pneumatic hose 13 for supplying compressed air to drive the endless chain of the device moving the brushes 12. Furthermore, mounted at the end of the apparatus 10 is a cleaning device 14 for cleaning the brushes 12, in which the brushes 12 are cleaned by the compressed air exhausted from the brush moving device. The chaff released from the brushes 12 is removed through a hose 15.

[0038] Fig. 2 illustrates the structure of the apparatus 10 for treating the surface of a rotating roller. The brushes 12 are connected to an endless chain 16 driven by a moving means 17. The moving means 17 comprises another endless chain 18, which is driven by a pneumatic cylinder 19. The cylinder 19 is supplied with compressed air via hoses 20 and 21 by using a control valve, which is not shown in Fig. 2, to direct the compressed air alternately to opposite sides of the piston 22. This causes the piston 22 and the piston rod 23 to reciprocate. The piston rod 23 is connected to the chain 18 via a connecting piece 24, so when the piston 22 is moving, the endless chain 18 of the moving means 17 is also moving to and fro.

[0039] In the apparatus 10 presented in Fig. 2, the endless chain 18 of the moving means 17 is passed over a chain sprocket 25. Mounted on the same shaft 26 with the sprocket 25 is another chain sprocket 27, over which the endless chain 16 carrying the brushes 12 is passed. Between the sprockets 25 and 27 there is a dummy coupling, which is not shown in detail in Fig. 2- By using a dummy coupling, the reciprocating motion imparted from the piston 22 to chain 18 can be converted into a unidirectional motion of chain 16. In this way, the brushes 12 are made to brush the cylinder surface continuously in the same direction.

[0040] The thrust motion of the piston 22 to the right in Fig. 2 is retarded by a control valve so that the velocity of chain 16 and therefore that of the brushes 12 will be slow enough, e.g. about 1 m/min., whereas the return motion of the piston 22 in the reverse direction is substantially faster. This motion can be made so fast that the air exhausted from the cylinder 19 via hose 28 can be used to produce an effective air blast impulse from a jet 29 in the cleaning device 14 to clean the brush 12 under the jet. Chaff removed from the brush 12 is carried away via a hose 30.

[0041] Alternatively, the endless chain 16 carrying the brushes 12 in Fig. 2 is driven by an electric motor, which is not shown in the drawings. In this case, the motion of the chain 16 can be adjusted to an appropriate level by using a suitable reduction gear or by adjusting the rotational speed of the electric motor. An electric motor drive provides the advantage that the direction of motion of the chain 16 and therefore of the brushes 12 can be easily changed. A change of direction may be necessary e.g. when a brush 16 has caught a body that does not come off from the brush 16 at the end of the roller or at the edge of the belt. In such a case, a change of direction of motion of the brush 16 may cause this body to come off.

[0042] The electric motor and the reduction gear naturally have to be completely leakproof so that e.g. no oil can leak from them onto the moving surface or paper web. The electric motor drive can be implemented in the same size as the pneumatic moving means 17 presented in Fig. 2. In this case, the electric motor drive and the

pneumatic moving means 17 are interchangeable components.

[0043] Fig. 3 presents an apparatus 10 for treating the surface of a roller 11, mounted on the frame 31 of a doctor via guide rails 33. The apparatus 10 can be moved on the guide rails 33 to the left in Fig. 3 so as to bring the brushes 12 into contact with the surface of the roller 11. In the position shown in Fig. 3, the doctor frame 31 has been turned in the clockwise direction so that the doctor blade 32 is not in contact with the surface of the roller 11. Thus, only the apparatus 10 for treating the surface of the roller 10 is active while the doctor blade 32 is not.

[0044] Fig. 4 presents a situation where the apparatus 10 for treating the surface of a roller 11 has been moved on the guide rails 33 of the doctor frame 31 to the right and the doctor frame 31 has been rotated anti-clockwise so that the doctor blade 32 touches the surface of the roller 11. In this case, the doctor blade 32 is active, shaving the surface of the roller 11. In this situation, the apparatus 10 can be used for cleaning the doctor blade 32 when necessary.

[0045] In Fig. 3 and 4, the surface treatment apparatus 10 is mounted on the doctor frame 31, but it can just as well be mounted on some other supporting structure, as illustrated in Fig. 13

[0046] Fig. 5 presents a replaceable brush 12 as used in the apparatus 10 for treating the surface of a roller 11, the frame 34 of the brush being fastened with bolts 35 to a connecting piece 36 which connects the brush 12 to the endless chain 16 of the apparatus 10. The metallic bristles 37 are fastened to the frame 34 of the brush 12 by a reliable method known in itself, e.g. by gluing, crimping or by a similar method

[0047] Fig. 6 presents a replaceable brush 12 of the apparatus 10 for treating the surface of a roller 11, in front view, showing a frame 34 with holes 38 for bolts and a dense array of bristles 37 attached to the frame 34.

[0048] Fig. 7 presents a diagrammatic side view of a papery dryer 40 in which a paper web 41 is passed between two endless belts 42a and 42b and between their supporting rollers 44a and 44b. One of the belts 42 and 42b is hot and the other is cold. In this device known in itself, each belt 42a, 42b is provided with a surface treatment apparatus 10a, 10b corresponding to those presented in the previous figures, in which they were installed on rollers 11.

[0049] Fig. 8 presents another paper dryer 40, in which the paper web 41 is passed between a roller 11 and an endless metallic belt 42, which press the paper web between them.

[0050] Between the paper web 41 and the metallic belt, a felt 43 is provided. In this paper dryer 40, a surface treatment apparatus 10a and 10b according to the invention is placed on each side of the endless metallic belt 42.

[0051] Fig. 9 presents a surface treatment apparatus 10 installed in conjunction with a rotating roller 11 and having brushes 12 connected to an endless chain. On one side of the surface treatment apparatus 10, the brushes 12a move in one direction parallel to the axis 45 of the roller 11, while on the opposite side of the surface treatment apparatus 10 the brushes 12b move in the opposite direction parallel to the axis 45 of the roller 11. As the surface treatment apparatus 10 in Fig. 9 is of a symmetrical design, it can be so installed in conjunction with the roller 11 that the brushes 12a and 12b moving in both directions are in contact with the surface of the roller 11.

[0052] Fig. 10 presents the roller 11 of Fig. 9 and the surface treatment apparatus 10 used together with it in top view. As shown in the figure, the brushes 12 connected to the endless chain move on the surface of the roller 11 in different directions on opposite sides of the surface treatment apparatus 10. The brushes 12a and 12b moving in both directions are used for treating and cleaning the surface of the roller 11. The essential point about the surface treatment apparatus 10 is that the brushes 12 advance at both ends of the roller 11 clearly beyond the end faces of the roller 11. In this way, the compressive stress applied to the brushes 12 during the surface treating movement by the surface of the roller 11 can be released outside the end faces of the roller 11 and the brushes can be cleaned, as described below.

[0053] Fig. 11 presents a surface treatment apparatus 10 placed between two rollers 11 a and 11b. As the surface treatment apparatus 10 has on both sides of it brushes 12a and 12b connected to an endless chain and moving in opposite directions, they can be used simultaneously for treating the surfaces of the rollers 11a and 11 b on either side of the surface treatment apparatus 10. Fig. 12 shows the rollers 11 a and 11b of Fig. 11 and the surface treatment apparatus 10 in top view.

[0054] Fig. 13 presents an embodiment in which the surface treatment apparatus 10 is placed between two rollers 11 a and 11 b and fastened to a supporting beam 47. However, the surface treatment apparatus 10 is movable so that it can be used alternately for treating the surface of one of the rollers 11 a and 11 b, and these may just as well be mounted e.g. one over the other. In a paper machine, the surface treatment apparatus 10 of Fig. 13 is changed from one roller to the other during a shutdown.

[0055] Fig. 14 presents the end of a roller 11 and part of a surface treatment apparatus 10. The figure shows three surface treatment brushes 12a, 12b and 12c of the surface treatment apparatus 10, each in a different functional situation, clearly illustrating the operating principle of the surface treatment brushes 12. All the surface treatment brushes 12a, 12b and 12c are moving to the left in Fig. 14. Brush 12a represents a surface treatment brush treating or cleaning the surface of the roller 11, with the bristles 37a pressed against the surface of the roller 11. The bristles 37a are now subject to a stress and in a somewhat bent position. In this situation, the bristles 37a loosen impurities from the surface of the roller 11, which impurities stick to the bristles 37a and are carried along with them toward end of the roller 11.

[0056] In Fig. 14, brush 12b represents a situation

where the bristles 37b pressed against the surface of the roller 11 and subject to stress are moving over the edge of the roller 11. At this point, the bent bristles 37b are released from their stressed state and spring with a fast movement into a straight position. At the same time, the dust particles and other impurities carried with the bristles 37b are removed from the bristles and flung in a direction away from the roller 11 as a consequence of this intensive movement of the bristles 37b.

[0057] In Fig. 14, the next brush 12c represents a brush which has already moved past the end face of the roller 11 and whose bristles 37c have been cleaned in the above-described manner. At the end of the surface treatment apparatus 10, the brush 12c connected to the endless chain turns and starts moving in the opposite direction, in other words, the brush 12c performs a return motion. According to the alternatives described above, the brush 12c may move idle to the other end of the surface treatment apparatus 10 or it may be performing surface treatment even during this motion.

[0058] In view of the examples presented above, it is obvious to the person skilled in the art that different embodiments of the invention may vary greatly. It is further obvious that surface treatment apparatuses as provided by the invention can be used in a wide variety of applications for treating or cleaning a moving surface.

Claims

1. Surface treatment apparatus (10) for coating or cleaning a moving surface, such as a rotating roller (11), a moving belt (42) or a similar surface, said apparatus comprising

   - at least one surface treatment brush (12) having bristles (37) made of an elastic material, and means for pressing the points of the bristles (37) of the surface treatment brush (12) against the moving surface (11, 42),
   - and means (16) for moving the surface treatment brush (12) transversely relative to the direction of motion of the surface, e.g. in the direction of the axis (45) of the rotating roller or the axis of a roller (44) supporting the moving belt, **characterized in that**
   - the surface treatment brushes (12) of the surface treatment apparatus (10) are attached to an endless loop (16), such as a chain, by means of which the brushes can be moved transversely across the moving surface (11, 42) and further beyond the edge of the surface so that the bristles (37) of the surface treatment brush are disengaged from the moving surface, and that
   - in the return path of the brushes in the endless loop (16), the brushes (12) move in the opposite direction across the moving surface (11, 42) and further over the opposite edge.

2. Surface treatment apparatus (10) as defined in claim 1, **characterized in that** in the surface treatment apparatus (10) the surface treatment brushes (12) attached to an endless chain (16) are in contact with the moving surface (11, 42) during their movement in one direction or during their movement in both directions.

3. Surface treatment apparatus (10) as defined in claim 1 or 2 **characterized in that** in the surface treatment apparatus (10) the surface treatment brushes (12) attached to an endless chain (16) are in contact with one moving surface (11, 42) or simultaneously with two moving surfaces, such as two adjacent rollers.

4. Surface treatment apparatus (10) as defined in claim 1 or 2 , **characterized in that** in the surface treatment apparatus (10) the surface treatment brushes (12) attached to an endless chain (16) can be alternately brought into contact with two moving surfaces (11. 42), such as two adjacent rollers.

5. Surface treatment apparatus (10) as defined in any one of claims 1-4 , **characterized in that** in the surface treatment apparatus (10) the direction of motion of the surface treatment brushes (12) attached to an endless chain (16) can be reversed.

6. Surface treatment apparatus (10) as defined in any one of claims 1-5, **characterized in that** the surface treatment apparatus (10) provided with an endless chain (16) and surface treatment brushes (12) is a separate unit which is mounted as such in conjunction with a doctor blade (32) on a roller (11).

7. Surface treatment apparatus as defined in any one of claims 1-6, **characterized in that** the moving means (17) of the surface treatment apparatus (10) provided with an endless chain (16) and surface treatment brushes (12) comprises an actuator (19) consisting of an electric device or a pneumatic cylinder, which moves the endless chain (16) and the surface treatment brushes (12) attached to it along the moving surface (11, 42).

8. Surface treatment apparatus (10) as defined in any one of claims 1-7, **characterized in that** in the surface treatment apparatus (10) provided with an endless chain (16) and surface treatment brushes (12) the bristles (37) of the brush of the surface treatment apparatus (10) are made of a metallic material, such as steel, stainless steel, brass, a synthetic material, such as plastic, e.g. teflon, or from natural bristles, such as bristles obtained from animals or plants.

9. Surface treatment apparatus (10) as defined in any one of claims 1-8, **characterized in that** the surface treatment apparatus (10) provided with an endless

chain (16) and surface treatment brushes (12) comprises at least one metallic brush which can be moved transversely across the moving surface (11, 42) and has metallic bristles (37), the points of which can be pressed against the moving surface to clean, abrade or oxidize said surface.

10. Surface treatment apparatus (10) as defined in any one of claims 1-9, **characterized in that** the surface treatment apparatus (10) provided with an endless chain (16) and surface treatment brushes (12) comprises at least one plastic brush which can be moved transversely across the moving surface (11, 42) and has plastic bristles, the points of which can be pressed against the moving surface to clean or coat said surface.

Patentansprüche

1. Vorrichtung zur Oberflächenbehandlung (10) zum Beschichten oder Reinigen einer beweglichen Oberfläche wie etwa einer rotierenden Rolle (11), eines beweglichen Gurtbands (42) oder einer ähnlichen Oberfläche, bestehend aus

- mindestens einer Oberflächenbehandlungsbürste (12) mit Borsten (37) aus elastischem Material, und einer Vorrichtung, mit welcher die Borstenspitzen (37) der Oberflächenbehandlungsbürste (12) gegen die bewegliche Oberfläche (11, 42) gedrückt werden
- und einer Vorrichtung (16) zum Bewegen der Oberflächenbehandlungsbürste (12) quer zur Bewegungsrichtung der Oberfläche, zum Beispiel in Richtung der Achse (45) der rotierenden Rolle oder einer Rolle (44) zur Abstützung des beweglichen Gurtbands,

dadurch gekennzeichnet, dass

- die Oberflächenbehandlungsbürsten (12) der Vorrichtung zur Oberflächenbehandlung (10) an einer Endlosschleife (16) wie einer Kette befestigt sind, mit welcher die Bürsten in Querrichtung über die bewegliche Oberfläche (11, 22) und weiter über den Oberflächenrand hinaus bewegt werden können, so dass die Borsten (37) der Oberflächenbehandlungsbürste von der beweglichen Oberfläche getrennt werden und dass
- die Bürsten (12) bei der Rückführung der Endlosschleife (16) in der entgegengesetzten Richtung über die bewegliche Oberfläche (11,42) und weiter über den entgegengesetzten Rand hinaus bewegt werden.

2. Vorrichtung zur Oberflächenbehandlung (10) gemäß Anspruch 1, **dadurch gekennzeichnet , dass** die an einer Endloskette (16) befestigten Oberflächenbehandlungsbürsten (12) der Vorrichtung zur Oberflächenbehandlung (10) während ihrer Bewegung in eine oder beide Richtungen in Kontakt mit der beweglichen Oberfläche (11, 42) sind.

3. Vorrichtung zur Oberflächenbehandlung (10) gemäß Anspruch 1 oder 2, **dadurch gekennzeichnet , dass** die an einer Endloskette (16) befestigten Oberflächenbehandlungsbürsten (12) der Vorrichtung zur Oberflächenbehandlung (10) während ihrer Bewegung in Kontakt mit einer beweglichen Oberfläche (11, 42) oder gleichzeitig mit zwei beweglichen Oberflächen wie zwei nebeneinanderliegenden Rollen sind.

4. Vorrichtung zur Oberflächenbehandlung (10) gemäß Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die an einer Endloskette (16) befestigten Oberflächenbehandlungsbürsten (12) der Vorrichtung zur Oberflächenbehandlung (10) während ihrer Bewegung abwechselnd in Kontakt mit zwei beweglichen Oberflächen (11) wie zwei nebeneinanderliegenden Rollen gebracht werden können.

5. Vorrichtung zur Oberflächenbehandlung (10) gemäß einem der Ansprüche 1-4, **dadurch gekennzeichnet , dass** die Bewegungsrichtung der an einer Endloskette (16) befestigten Oberflächenbehandlungsbürsten (12) der Vorrichtung zur Oberflächenbehandlung (10) umgedreht werden kann.

6. Vorrichtung zur Oberflächenbehandlung (10) gemäß einem der Ansprüche 1-5, **dadurch gekennzeichnet , dass** die Vorrichtung zur Oberflächenbehandlung (10) mit ihrer Endloskette (16) und Oberflächenbehandlungsbürsten (12) eine eigene Einheit bildet, die in Verbindung mit einem Abstreifer (32) auf einer Rolle montiert ist.

7. Vorrichtung zur Oberflächenbehandlung gemäß einem der Ansprüche 1-5, **dadurch gekennzeichnet, dass** die Bewegungsvorrichtung (17) der Vorrichtung zur Oberflächenbehandlung (10) mit ihrer Endloskette (16) und den Oberflächenbehandlungsbürsten (12) mit einem Stellantrieb (19) ausgerüstet ist, der aus einer elektrischen Vorrichtung oder einem pneumatischen Zylinder besteht, die/der die Endloskette (16) und die daran befestigten Oberflächenbehandlungsbürsten (12) über die bewegliche Oberfläche (11, 42) bewegt.

8. Vorrichtung zur Oberflächenbehandlung (10) gemäß einem der Ansprüche 1-7, **dadurch gekennzeichnet , dass** die Borsten (37) der Oberflächenbehandlungsbürsten (12) an der Vorrichtung zur Oberflächenbehandlung (10) mit einer Endloskette (16) aus einem metallischen Material wie Stahl,

rostfreiem Stahl, Kupfer, oder einem synthetischen Material wie Kunststoff, etwa Teflon oder aus Naturborsten von Tieren oder Pflanzen bestehen.

9. Vorrichtung zur Oberflächenbehandlung (10) gemäß einem der Ansprüche1-8, **dadurch gekennzeichnet, dass** die Vorrichtung zur Oberflächenbehandlung mit Endloskette (16) und Oberflächenbehandlungsbürsten (12) mit mindestens einer Bürste aus Metall ausgestattet ist, die quer über die bewegliche Oberfläche (11, 42) bewegt werden kann und Metallborsten (37) hat, deren Spitzen gegen die bewegliche Oberfläche gedrückt werden können, um besagte Oberfläche zu reinigen, zu schleifen oder zu oxidieren.

10. Vorrichtung zur Oberflächenbehandlung (10) gemäß einem der Ansprüche1-9, **dadurch gekennzeichnet, dass** die Vorrichtung zur Oberflächenbehandlung mit Endloskette (16) und Oberflächenbehandlungsbürsten (12) mit mindestens einer Bürste aus Metall ausgestattet ist, die quer über die bewegliche Oberfläche (11, 42) bewegt werden kann und über Metallborsten (37) verfügt, deren Spitzen gegen die bewegliche Oberfläche gedrückt werden können, um besagte Oberfläche zu reinigen, zu schleifen oder zu oxidieren.

Revendications

1. Appareil de traitement de surface (10) pour enduire ou nettoyer une surface en mouvement, tel un rouleau en rotation (11), une courroie en mouvement (42) ou une surface similaire, ledit appareil comportant

- au moins une brosse de traitement de surface (12) ayant des poils (37) réalisés en un matériau élastique, et des moyens pour presser les pointes des poils (37) de la brosse de traitement de surface (12) contre la surface en mouvement (11, 42)
- et des moyens (16) pour mouvoir la brosse de traitement de surface (12) transversalement par rapport à la direction de mouvement de la surface, par ex. dans la direction de l'axe (45) du rouleau en rotation ou de l'axe d'un rouleau (44) supportant la courroie en mouvement,

caractérisé en ce que

- les brosses de traitement de surface (12) de l'appareil de traitement de surface (10) sont fixées sur une boucle sans fin (16), telle une chaîne, au moyen de laquelle les brosses peuvent êtres mues transversalement à travers la surface en mouvement (11, 42) et au-delà du bord de la surface de façon à ce que les poils (37) de la brosse de traitement de surface se désengagent de la surface en mouvement, et que
- sur le trajet de retour des brosses dans la boucle sans fin (16), les brosses (12) se meuvent dans la direction opposée à travers la surface en mouvement (11, 42) et au-delà du bord opposé.

2. Appareil de traitement de surface (10) selon la revendication 1, **caractérisé en ce que**, dans l'appareil de traitement de surface (10), les brosses de traitement de surface (12) fixées sur une chaîne sans fin (16) sont en contact avec la surface en mouvement (11, 42) durant leur mouvement dans une direction ou durant leur mouvement dans les deux directions.

3. Appareil de traitement de surface (10) selon la revendication 1 ou 2, **caractérisé en ce que**, dans l'appareil de traitement de surface (10), les brosses de traitement de surface (12) fixées sur une chaîne sans fin (16) sont en contact avec une surface en mouvement (11, 42) ou simultanément avec deux surfaces en mouvement, tels deux rouleaux adjacents.

4. Appareil de traitement de surface (10) selon la revendication 1 ou 2, **caractérisé en ce que**, dans l'appareil de traitement de surface (10), les brosses de traitement de surface (12) fixées sur une chaîne sans fin (16) peuvent être mises, de façon alternante, en contact avec deux surfaces en mouvement (11, 42), tels deux rouleaux adjacents.

5. Appareil de traitement de surface (10) selon l'une quelconque des revendications 1 à 4, **caractérisé en ce que**, dans l'appareil de traitement de surface (10), la direction de mouvement des brosses de traitement de surface (12) fixées sur une chaîne sans fin (16) est réversible.

6. Appareil de traitement de surface (10) selon l'une quelconque des revendications 1 à 5, **caractérisé en ce que** l'appareil de traitement de surface (10), munie d'une chaîne sans fin (16) et de brosses de traitement de surface (12), est une unité séparée qui est montée telle quelle en connexion avec une racle (32) d'un rouleau (11).

7. Appareil de traitement de surface selon l'une quelconque des revendications 1 à 6, **caractérisé en ce que** le moyen de mouvement (17) de l'appareil de traitement de surface (10) muni d'une chaîne sans fin (16) et de brosses de traitement de surface (12) comporte un actionneur (19) consistant en un dispositif électrique ou un vérin pneumatique, qui fait

mouvoir la chaîne sans fin (16) et les brosses de traitement de surface (12) fixées sur elle le long de la surface en mouvement (11, 42).

8. Appareil de traitement de surface (10) selon l'une quelconque des revendications 1 à 7, **caractérisé en ce que**, dans l'appareil de traitement de surface (10) muni d'une chaîne sans fin (16) et de brosses de traitement de surface (12), les poils (37) de la brosse de l'appareil de traitement de surface (10) sont réalisés en un matériau métallique, tels l'acier, l'acier inoxydable, le laiton, un matériau synthétique, telle plastique, par ex. le téflon, ou en poils naturels, tels les poils obtenus d'animaux ou de plantes.

9. Appareil de traitement de surface (10) selon l'une quelconque des revendications 1 à 8, **caractérisé en ce que** l'appareil de traitement de surface (10) muni d'une chaîne sans fin (16) et de brosses de traitement de surface (12) comporte au moins une brosse métallique qui peut être mue transversalement à travers la surface en mouvement (11, 42) et a des poils métalliques (37), dont les pointes peuvent être pressées contre la surface en mouvement pour nettoyer, poncer ou oxyder ladite surface.

10. Appareil de traitement de surface (10) selon l'une quelconque des revendications 1 à 9, **caractérisé en ce que** l'appareil de traitement de surface (10) muni d'une chaîne sans fin (16) et de brosses de traitement de surface (12) comporte au moins une brosse plastique qui peut être mue transversalement à travers la surface en mouvement (11, 42) et a des poils plastiques, dont les pointes peuvent être pressées contre la surface en mouvement pour nettoyer ou enduire ladite surface.

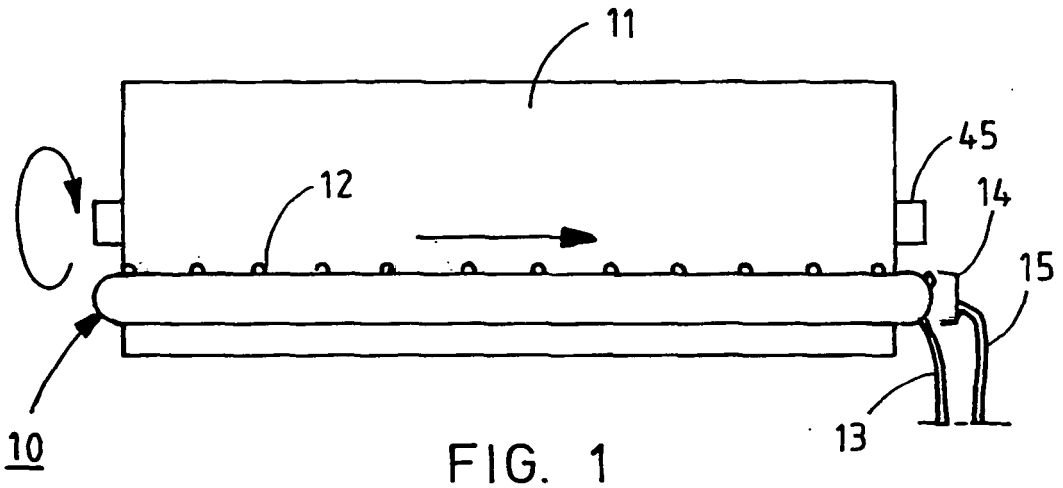

FIG. 1

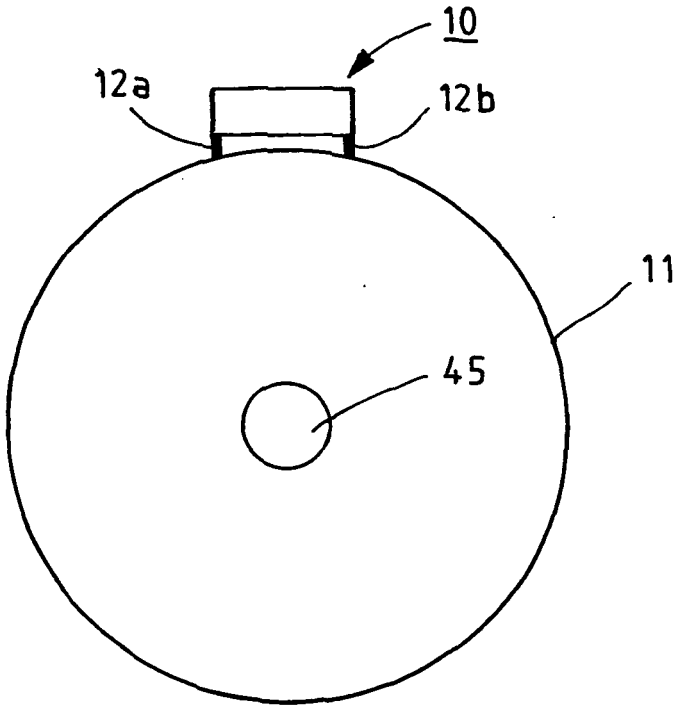

FIG 9

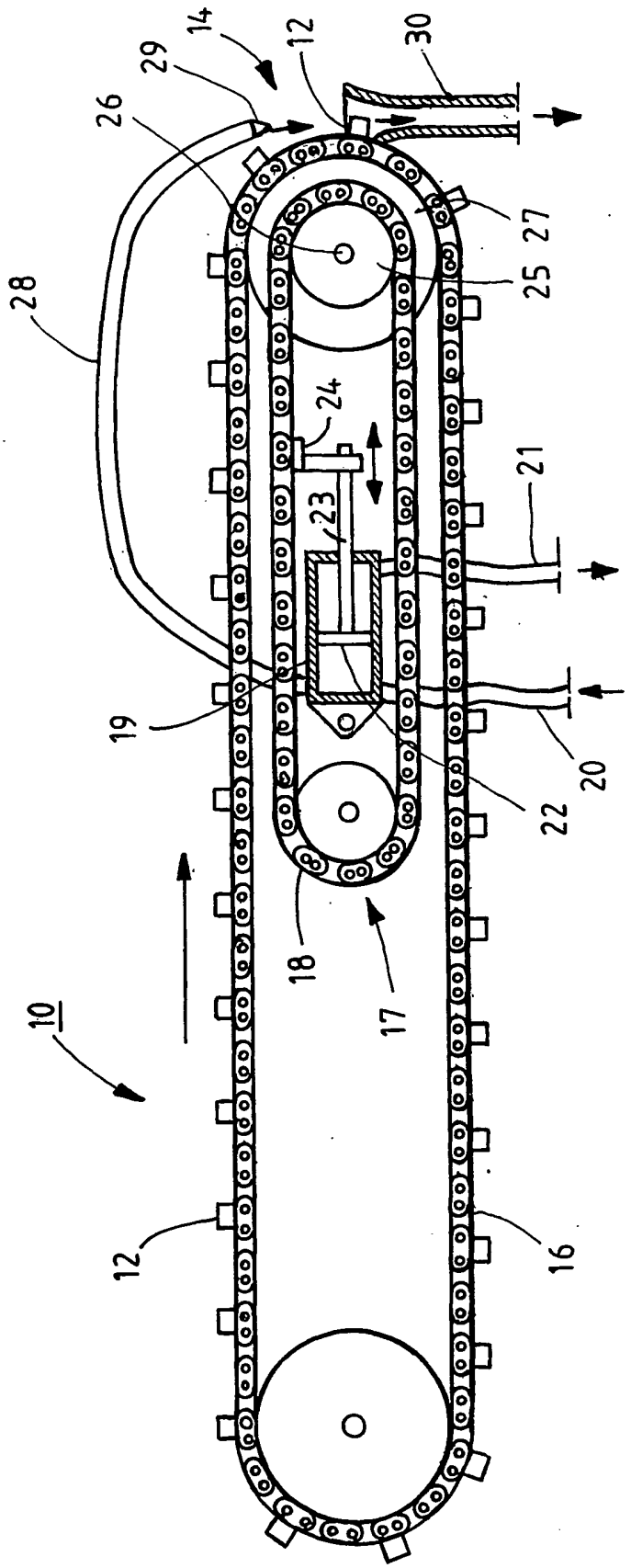

FIG. 2

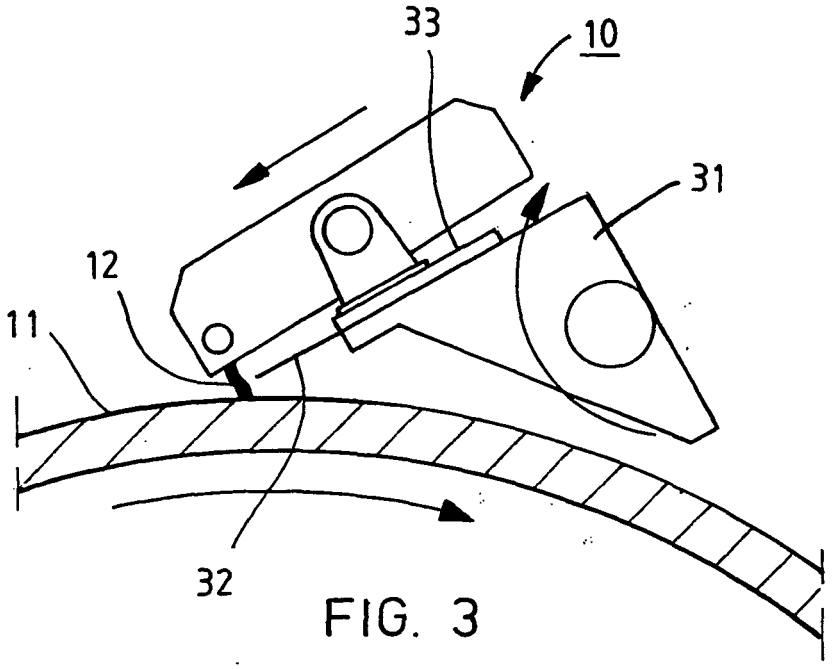

FIG. 3

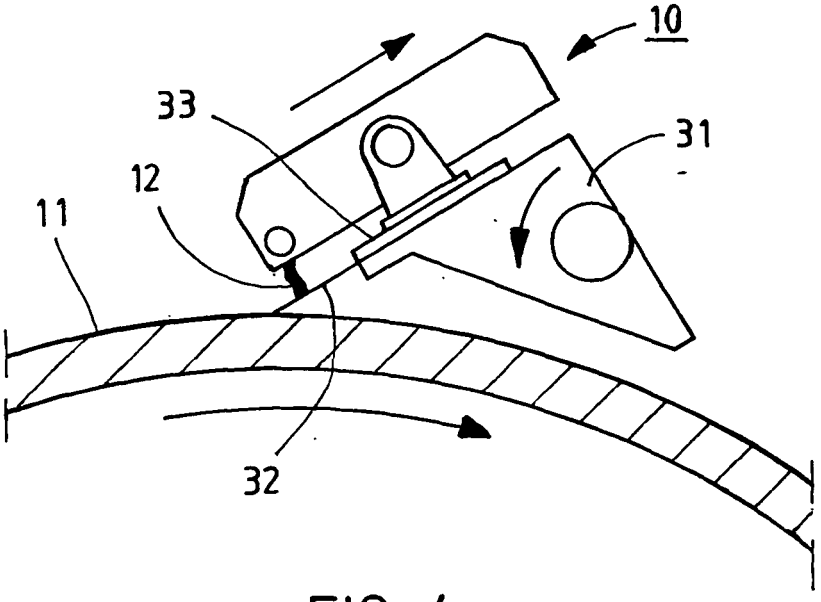

FIG. 4

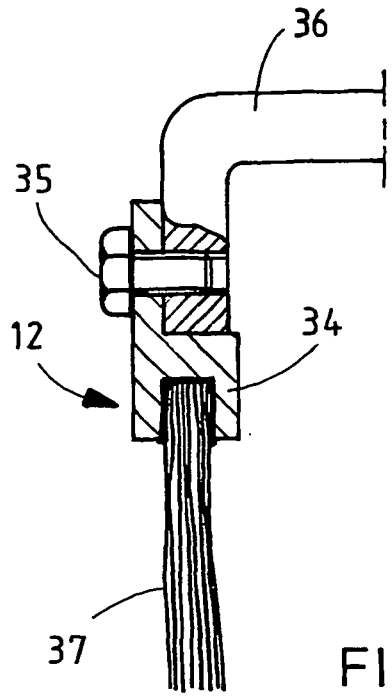

FIG. 5

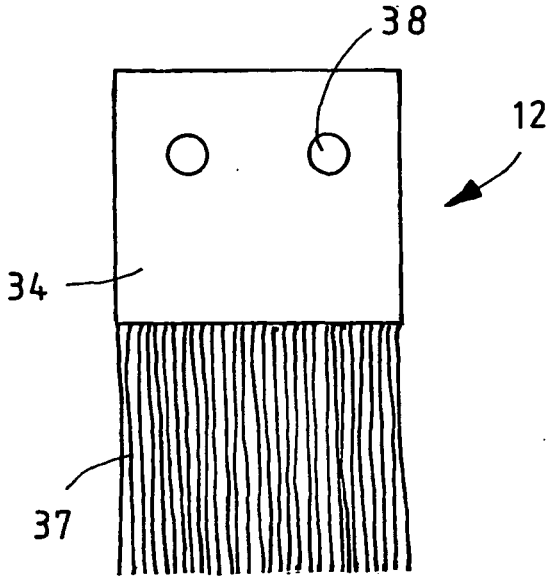

FIG. 6

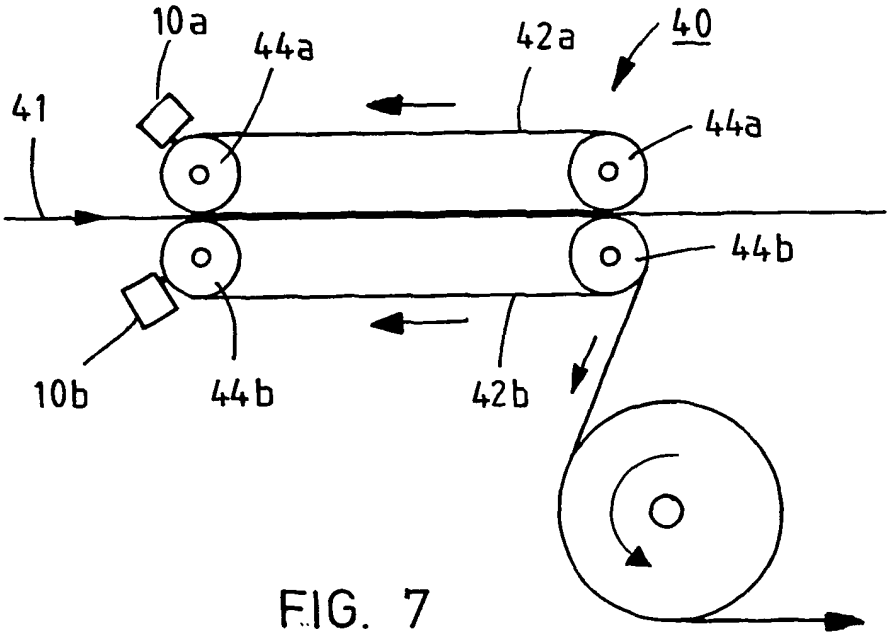
10a
44a
42a
40
41
44a
44b
10b
44b
42b

FIG. 7

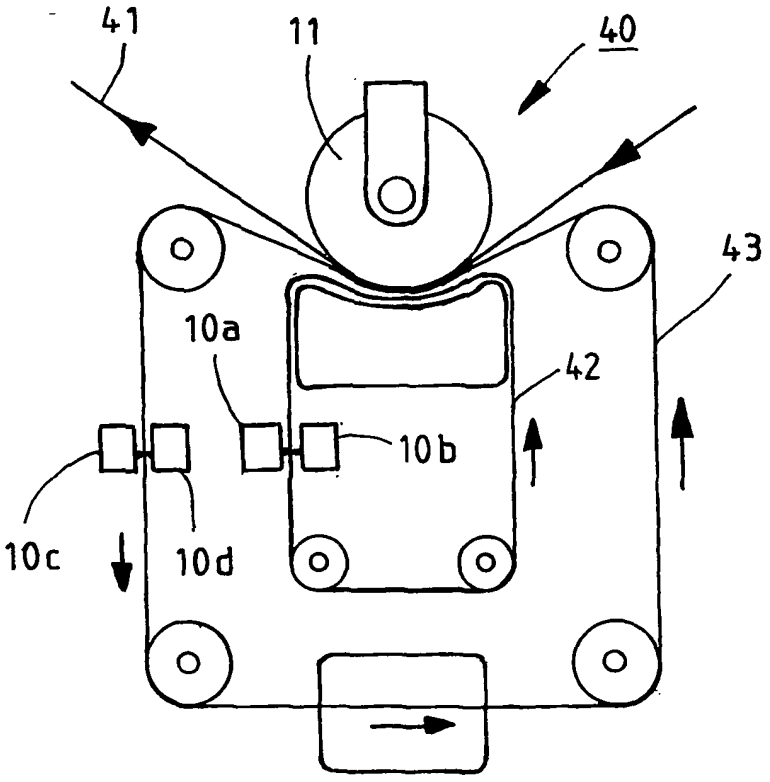
41
11
40
43
10a
42
10b
10c
10d

FIG. 8

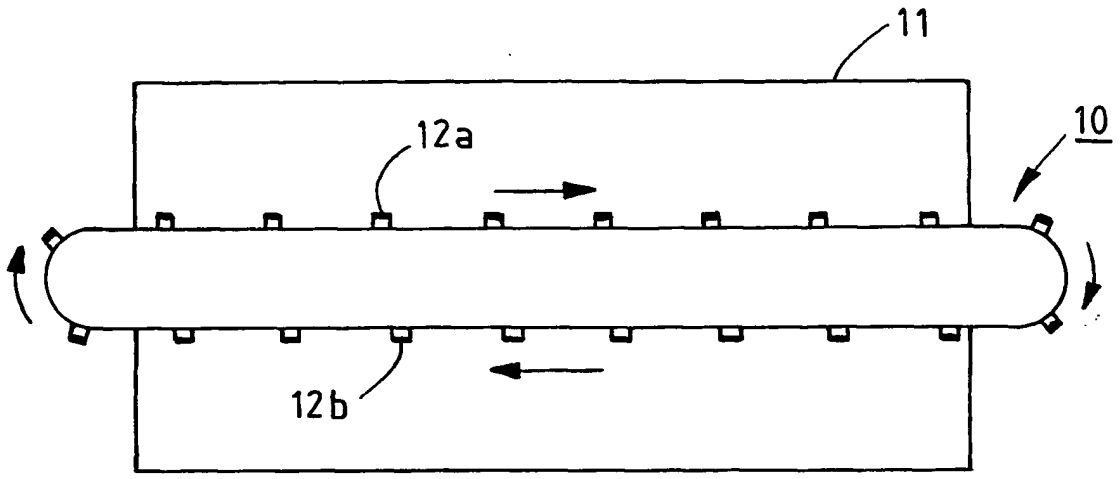

FIG. 10

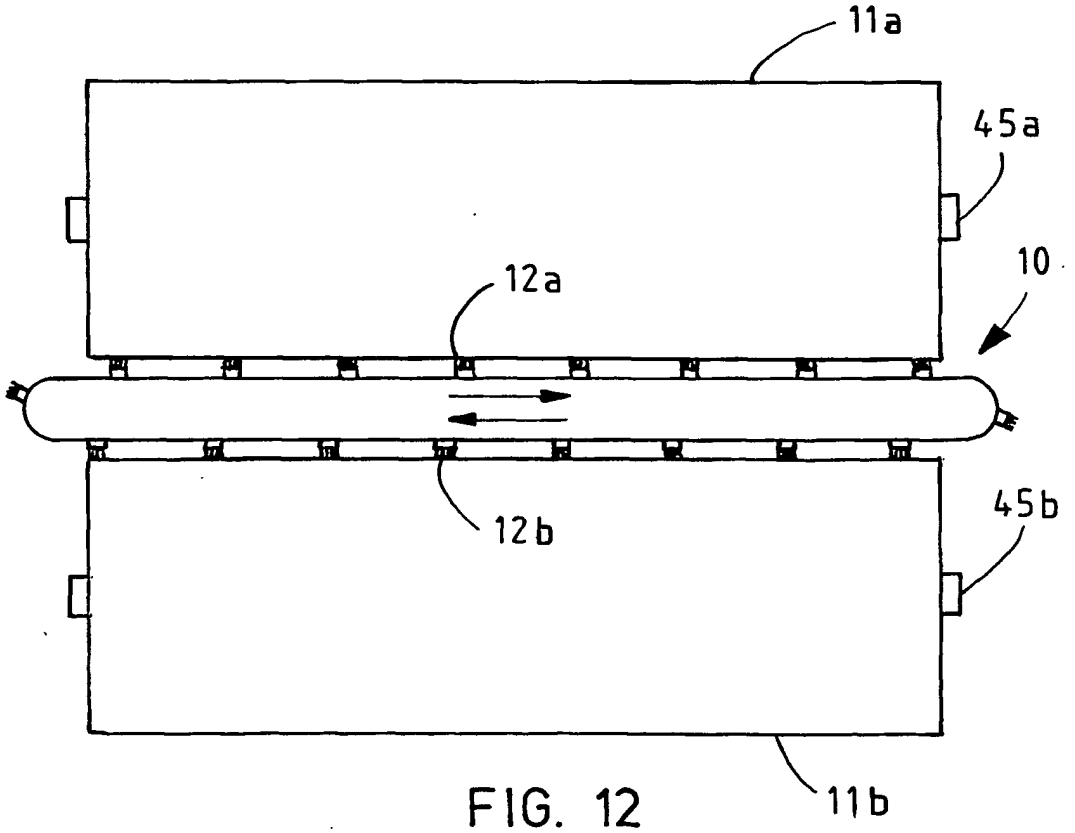

FIG. 12

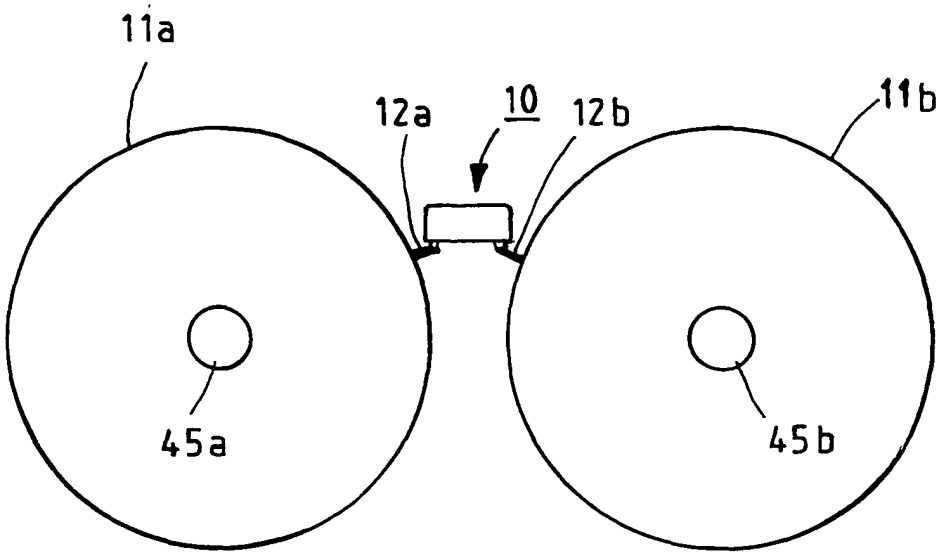

FIG. 11

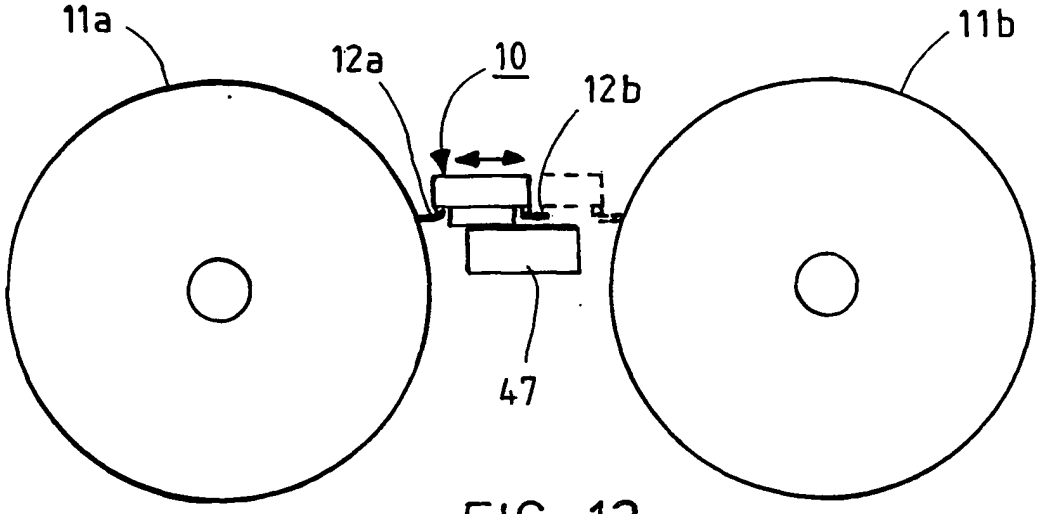

FIG. 13

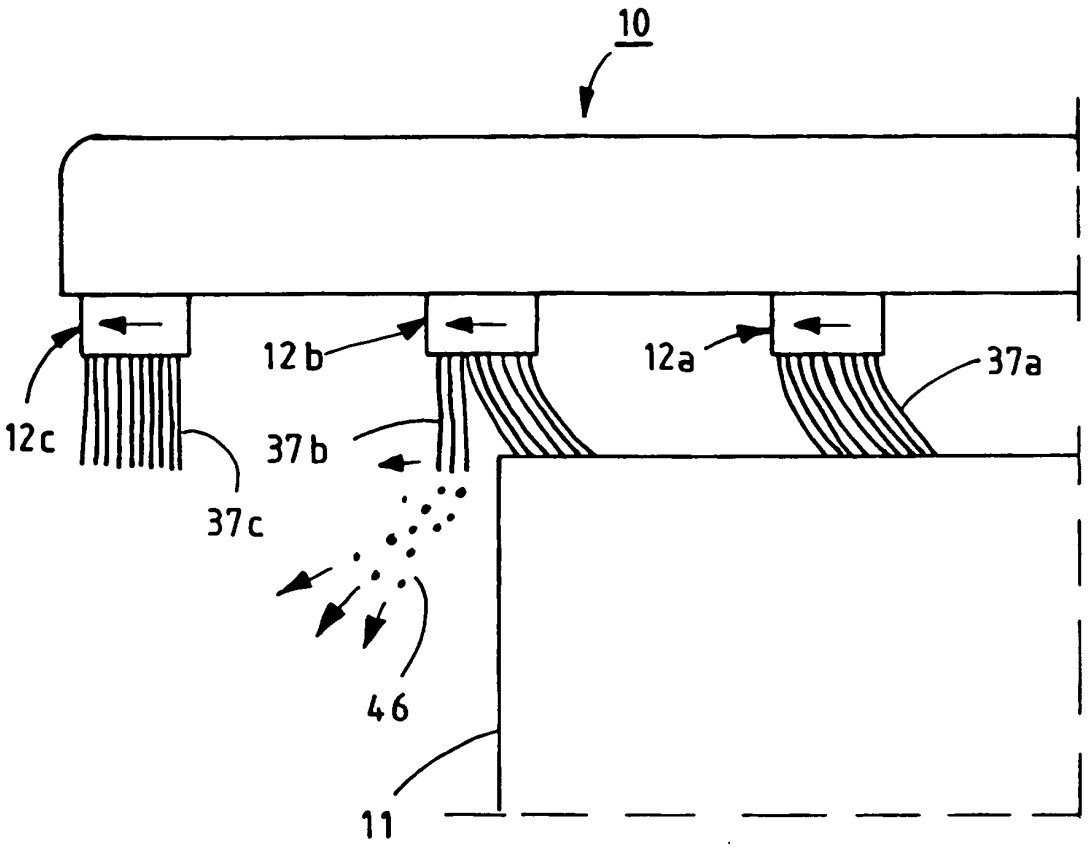

FIG. 14